

1. A device for handling pressurized gas, said device comprising:
a first flow path for flowing gas at a first flow rate through said device;
a second flow path for flowing gas at a second flow rate through said
device, said second flow rate being greater than said first flow rate; and

5 a handle arranged to move in a first direction to open said first flow
path and to enable opening of said second flow path, and in a second direction
to open said second flow path, said second direction being different than said
first direction.

10 2. The device of claim 1, wherein said first direction is an axial
direction.

3. The device of claim 2, wherein said second direction is a rotational
direction.

15 4. The device of claim 3, further comprising a spring for biasing said
handle in a third direction, said third direction being opposite to said first
direction.

20 5. The device of claim 4, further comprising an engageable torque
unit for transmitting torque from said handle to open said second flow path.

25 6. The device of claim 1, wherein said handle includes a button that
moves in said first direction and a handle member that moves in said second
direction.

7. A surge prevention valve comprising:
a housing having an inlet, an outlet, and a flow path from said inlet to
said outlet;

a seal unit for closing said flow path, said seal unit including a bleed passageway; and

an actuator for opening said bleed passageway and then moving said seal unit to open said flow path.

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8. The valve of claim 7, further comprising threads for connecting said seal unit to said housing.

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9. The valve of claim 8, wherein said housing includes a valve seat, and wherein said actuator is arranged to threadedly move said seal unit away from said valve seat to open said flow path.

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10. The valve of claim 9, further comprising a valve rod for closing said bleed passageway, said valve rod being slidably located within said seal unit.

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11. The valve of claim 10, further comprising an engageable torque unit for transmitting torque from said actuator to said seal unit to rotate said seal unit with respect to said housing, said torque unit being located within said housing.

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12. The valve of claim 11, wherein said engageable torque unit includes pins and openings for receiving said pins.

13. The valve of claim 11, further comprising a spring for biasing said torque unit to a disengaged position.

14. The valve of claim 13, wherein said actuator includes a handle and a cover, said handle being slidably and rotatably supported within said cover, said cover being fixed with respect to said housing.

15. A method of operating a surge prevention valve, said method comprising the steps of:

moving at least a portion of a handle in a first direction to cause gas to flow through a first path at a first flow rate; and

subsequently, moving said handle in a second direction to cause gas to flow through a second path at a second flow rate, said second direction being different than said first direction, said second flow rate being greater than said first flow rate.

16. The method of claim 15, further comprising the steps of moving said handle in said first direction and then in a third direction to close said second path, said third direction being opposite to said second direction.

17. The method of claim 16, wherein said step of moving said handle in said second direction includes the step of rotating said handle to an open position.

18. The method of claim 16, further comprising the step of pushing at least a portion of said handle in an axial direction from a first axial position to a second axial position against the bias of a spring.

19. The method of claim 18, wherein said step of rotating said handle to an open position is enabled by locating said handle in said second axial position.

20. The method of claim 19, further comprising the step of rotating a threaded seal unit into a closed position to close said second path.

21. The method of claim 20, wherein said first path is located within said seal unit, and wherein said step of pushing said handle in said axial direction causes a valve rod to slide within said seal unit to open said first path.

5 22. The method of claim 15, further comprising the step of causing oxygen to flow through said valve, through a pressure regulator and then to an operative device.

10 23. The method of claim 22, wherein said operative device is a face mask for a patient.

15 24. A device for handling pressurized gas, said device comprising:
a button arranged to move in an axial direction to open a bleed
passageway for gas to flow at a first flow rate;
a handle arranged to move in a rotational direction to open a path for
gas to flow at a second flow rate, wherein said button forms part of said handle,
and wherein said second flow rate is greater than said first flow rate.

20 25. The device of claim 24, further comprising a spring for biasing said button in a third direction opposite to said first direction.

25 26. A device for handling pressurized gas, said device comprising:
a housing having an inlet, an outlet, and a flow path from said inlet to said outlet;

first and second valves located within said housing; and
an actuator arranged to initially open said first valve for flowing gas at a first flow rate through a pressurization orifice, and to subsequently open said second valve for flowing gas at a second flow rate through said device, said second flow rate being greater than said first flow rate.

27. The device of claim 26, wherein said actuator further comprises a piston unit slidably located within said actuator.

5 28. The device of claim 27, wherein said piston unit comprises an upper seat of said first valve, said upper seat being in communication with an upper portion of said pressurization orifice.

10 29. The device of claim 28 further comprising a lower cup-shaped valve element located within said housing, said lower cup-shaped valve element including a lower seat of said second valve, said lower seat being in communication with a lower portion of said pressurization orifice.

15 30. The device of claim 29 further comprising a spring for biasing said actuator in a first direction and said lower cup-shaped valve element in a second direction, said first direction being opposite to said second direction.

20 31. The device of claim 30, wherein said actuator further comprises a cover and an actuator body, said cover being fixed with respect to said housing, and said piston unit being rotatably supported within said actuator body.

32. The device of claim 26, wherein said gas is oxygen.

33. The device of claim 26, wherein said gas is nitrous oxide.

25 34. A surge prevention dual-path valve comprising:
a housing having an inlet, an outlet, and a flow path from said inlet to said outlet;
a first valve located within said housing, said first valve comprising an upper seat in communication with an upper portion of a pressurization orifice;

a second valve located within said housing, said second valve comprising a lower seat in communication with a lower portion of said pressurization orifice; and

a piston unit arranged to initially move said upper seat in an axial direction to open said pressurization orifice, and to subsequently move said lower seat in said axial direction to open said flow path.

35. The dual-path valve of claim 34, wherein said piston unit is slidably located within an actuator unit of said housing.

36. The dual-path valve of claim 35, wherein said actuator unit is arranged to threadedly move in said axial direction said piston unit and said upper seat away from said upper portion of said pressurization orifice.

37. The dual-path valve of claim 36, wherein said actuator unit is further arranged to subsequently threadedly move in said axial direction said piston unit and said lower seat to open said second valve.

38. The dual-path valve of claim 37, further comprising a spring for biasing said actuator unit in a first direction and said lower seat in a second direction, said first direction being opposite to said second direction.

39. A method of operating a surge prevention dual-path valve, said method comprising the steps of:

moving at least a portion of a piston unit in an axial direction to cause gas to flow through a pressurization orifice of a first valve at a first flow rate; and subsequently moving said piston unit in said axial direction to cause gas to flow through a second valve at a second flow rate, said second flow rate being greater than said first flow rate.

40. The method of claim 39, further comprising the step of rotating said piston unit to a first axial position.

5 41. The method of claim 40, wherein said piston unit is rotated through at least 270 degrees before said gas flows through said second valve.

42. The method of claim 41, wherein said gas flows through said first valve for at least 0.25 seconds before said gas flows through said second valve.

10 43. The method of claim 41, wherein said gas flows through said second valve before said piston unit is rotated through 450 degrees.

15 44. The method of claim 43, wherein an operator removes his or her hand from a rotatable valve handle and re-grips said handle after said gas flows through said first valve and before said gas flows through said second valve.

20 45. The method of claim 40, further comprising the step of rotating said piston unit from said first axial position to a second axial position in the direction of the bias of a spring.

25 46. The method of claim 45, wherein said step of rotating said piston unit to a fully open position is enabled by locating said piston unit in said second axial position.

47. The method of claim 39, further comprising the step of causing oxygen to flow through said dual-path valve, through a pressure regulator and then to an operative device.

48. The method of claim 47, wherein said operative device is a face mask for a patient.

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50. The method of claim 49, wherein said operative device is a face mask for a patient.

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Figure 1. Schematic representation of the experimental design. The subjects were divided into two groups: the control group (CG) and the experimental group (EG). The CG was divided into two subgroups: the control group (CG) and the control group (CG). The EG was divided into two subgroups: the experimental group (EG) and the experimental group (EG). The subjects were divided into two groups: the control group (CG) and the experimental group (EG). The CG was divided into two subgroups: the control group (CG) and the control group (CG). The EG was divided into two subgroups: the experimental group (EG) and the experimental group (EG).